

IN THE CLAIMS

Claim 1. (Currently Amended) A apparatus comprising:
a first processor and a second processor each having a scoreboard and a decoder;
a plurality of memory devices coupled to the first processor and the second processor;
a register buffer coupled to the first processor and the second processor;
a trace buffer coupled to the first processor and the second processor; and
a plurality of memory instruction buffers coupled to the first processor and the second processor;
wherein the first processor and the second processor perform single threaded applications using multithreading resources.

Claim 2. (Original) The apparatus of claim 1, wherein the memory devices comprise of a plurality of cache devices.

Claim 3. (Original) The apparatus of claim 1, wherein the first processor is coupled to at least one of a plurality of zero level (L0) data cache devices and at least one of a plurality of L0 instruction cache devices, and the second processor is coupled to at least one of the plurality of L0 data cache devices and at least one of the plurality of L0 instruction cache devices.

Claim 4. (Currently Amended) The apparatus of claim 3, wherein each of the plurality of L0 data cache devices having exact copies of store instruction data-cache instructions, and each of the plurality of L0 instruction-cache devices having exact copies of instruction-cache instructions.

Claim 5. (Original) The apparatus of claim 1, wherein the plurality of memory instruction buffers includes at least one store forwarding buffer and at least one load-ordering buffer.

Claim 6. (Original) The apparatus of claim 5, the at least one store forwarding

buffer comprising a structure having a plurality of entries, each of the plurality of entries having a tag portion, a validity portion, a data portion, a store instruction identification (ID) portion, and a thread ID portion.

Claim 7. (Original) The apparatus of claim 6, the at least one load ordering buffer comprising a structure having a plurality of entries, each of the plurality of entries having a tag portion, an entry validity portion, a load identification (ID) portion, and a load thread ID portion.

Claim 8 (Canceled)

Claim 9. (Currently Amended) The apparatus of claim 1, the trace buffer is a circular buffer having ~~an array with head and tail pointers, the head and tail pointers having a wrap-around bit.~~

Claim 10. (Original) The apparatus of claim 1, the register buffer comprising an integer register buffer and a predicate register buffer.

Claim 11. (Currently Amended) A method comprising:
executing a plurality of instructions in a first thread by a first processor; ~~and~~
executing the plurality of instructions in the first thread by a second processor as directed by the first processor, the second processor executing the plurality of instructions ahead of the first processor; and
tracking at least one register that is one of loaded from a register file buffer, and written by said second processor, said tracking executed by said second processor.

Claim 12. (Original) The method of claim 11, further including:
transmitting control flow information from the second processor to the first processor, the first processor avoiding branch prediction by receiving the control flow information; and
transmitting results from the second processor to the first processor, the first processor avoiding executing a portion of instructions by committing the results of the portion of instructions into a register file from a trace buffer.

- Claim 13. (Original) The method of claim 12, further including:
duplicating memory information in separate memory devices for independent access by the first processor and the second processor.
- Claim 14. (Currently Amended) The method of claim 12, further including:
clearing a store validity bit and setting a mispredicted bit in a load entry in the trace buffer if a replayed store instruction has a matching store identification (ID) portion in a load buffer.
- Claim 15. (Currently Amended) The method of claim 12, further including:
setting a store validity bit if a store instruction that is not replayed matches a store identification (ID) portion in a load buffer.
- Claim 16. (Original) The method of claim 12, further including:
flushing a pipeline, setting a mispredicted bit in a load entry in the trace buffer and restarting a load instruction if one of the load is not replayed and does not match a tag portion in a load buffer, and the load instruction matches the tag portion in the load buffer while a store valid bit is not set.
- Claim 17. (Currently Amended) The method of claim 12, further including:
executing a replay mode at a first instruction of a speculative thread;
~~terminating the replay mode and the execution of the speculative thread if a partition in the trace buffer is approaching an empty state.~~
- Claim 18. (Original) The method of claim 12, further including:
supplying names from the trace buffer to preclude register renaming;
issuing all instructions up to a next replayed instruction including dependent instructions;
issuing instructions that are not replayed as no-operation (NOPs) instructions;
issuing all load instructions and store instructions to memory;
committing non-replayed instructions from the trace buffer to the register file.
- Claim 19. (Original) The method of claim 12, further including:

clearing a valid bit in an entry in a load buffer if the load entry is retired.

Claim 20. (Currently Amended) An apparatus comprising a machine-readable medium containing instructions which, when executed by a machine, cause the machine to perform operations comprising:

executing a first thread from a first processor; ~~and~~
executing the first thread from a second processor as directed by the first processor, the second processor executing instructions ahead of the first processor; ~~and~~
tracking at least one register that is one of loaded from a register file buffer, and written by said second processor, said tracking executed by said second processor.

Claim 21. (Original) The apparatus of claim 20, further containing instructions which, when executed by a machine, cause the machine to perform operations including:

transmitting control flow information from the second processor to the first processor, the first processor avoiding branch prediction by receiving the control flow information.

Claim 22. (Original) The apparatus of claim 21, further containing instructions which, when executed by a machine, cause the machine to perform operations including:

duplicating memory information in separate memory devices for independent access by the first processor and the second processor.

Claim 23. (Original) The apparatus of claim 21, further containing instructions which, when executed by a machine, cause the machine to perform operations including:

clearing a store validity bit and setting a mispredicted bit in a load entry in the trace buffer if a replayed store instruction has a matching store identification (ID) portion.

Claim 24. (Original) The apparatus of claim 21, further containing instructions which, when executed by a machine, cause the machine to perform operations

including:

setting a store validity bit if a store instruction that is not replayed matches a store identification (ID) portion.

Claim 25. (Original) The apparatus of claim 21, further containing instructions which, when executed by a machine, cause the machine to perform operations including:

flushing a pipeline, setting a mispredicted bit in a load entry in the trace buffer and restarting a load instruction if one of the load is not replayed and does not match a tag portion in a load buffer, and the load instruction matches the tag portion in the load buffer while a store valid bit is not set.

Claim 26. (Original) The apparatus of claim 21, further containing instructions which, when executed by a machine, cause the machine to perform operations including:

executing a replay mode at a first instruction of a speculative thread;
terminating the replay mode and the execution of the speculative thread if a partition in the trace buffer is approaching an empty state.

Claim 27. (Original) The apparatus of claim 21, further containing instructions which, when executed by a machine, cause the machine to perform operations including:

supplying names from the trace buffer to preclude register renaming;
issuing all instructions up to a next replayed instruction including dependent instructions;
issuing instructions that are not replayed as no-operation (NOPs) instructions;
issuing all load instructions and store instructions to memory;
committing non-replayed instructions from the trace buffer to the register file.

Claim 28. (Original) The apparatus of claim 21, further containing instructions which, when executed by a machine, cause the machine to perform operations including:

clearing a valid bit in an entry in a load buffer if the load entry is retired.

Claim 29. (Currently Amended) A system comprising:

a first processor; and a second processor each having a scoreboard and a decoder;

~~a second processor;~~

a bus coupled to the first processor and the second processor;

a main memory coupled to the bus;

a plurality of local memory devices coupled to the first processor and the second processor;

a register buffer coupled to the first processor and the second processor;

a trace buffer coupled to the first processor and the second processor; and

a plurality of memory instruction buffers coupled to the first processor and the second processor,

wherein the first processor and the second processor perform single threaded applications using multithreading resources.

Claim 30. (Original) The system of claim 29, the local memory devices comprise a plurality of cache devices.

Claim 31. (Original) The system of claim 30, the first processor is coupled to at least one of a plurality of zero level (L0) data cache devices and at least one of a plurality of L0 instruction cache devices, and the second processor is coupled to at least one of the plurality of L0 data cache devices and at least one of the plurality of L0 instruction cache devices.

Claim 32. (Currently Amended) The system of claim 31, wherein each of the plurality of L0 data cache devices having exact copies of store instruction data-cache instructions, ~~and each of the plurality of L0 instruction cache devices having exact copies of instruction-cache instructions.~~

Claim 33. (Original) The system of claim 31, the first processor and the second processor each sharing a first level (L1) cache device and a second level (L2) cache

device.

Claim 34. (Original) The system of claim 29, wherein the plurality of memory instruction buffers includes at least one store forwarding buffer and at least one load ordering buffer.

Claim 35. (Original) The system of claim 34, the at least one store forwarding buffer including a structure having a plurality of entries, each of the plurality of entries having a tag portion, a validity portion, a data portion, a store instruction identification (ID) portion, and a thread ID portion.